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Enamel & dentin abnormalities in primary & permanent dentitions and multiple impacted permanent teeth associated with vitamin D deficiency: Report of two rare cases

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ABSTRACT

Tooth eruption and shedding is a continuous process, which replaces the exfoliated primary teeth with permanent teeth. The tooth eruption is defined as the occlusal or axial movement of the tooth from its developmental position within the jaw to its functional position in the occlusal plane, whereas the impacted tooth is known as the tooth which ceases to erupt in the oral cavity. Sometimes impaired tooth eruption takes place in the form of delayed or complete absence of eruption, giving rise to impacted/embedded permanent teeth and over-retained deciduous teeth. Systemic causes such as syndromes, nutritional deficiencies of Vit D & Vit B12, metabolic and hormonal disorders can also contribute to multiple impacted permanent teeth. Vit D deficiency affects enamel & dentin formation and considered as an etiological factor for delayed eruption & multiple impactions of permanent teeth and over-retained deciduous teeth. Vit D deficiencies at very young age have several consequences on the normal growth and development of oral structures. Appropriate interdisciplinary care is needed to successfully address dental abnormalities in primary and permanent dentitions. The attention of dental surgeons is drawn to consider Vit D deficiency as one of the foremost nutritional deficiency responsible for abnormality of enamel & dentin as well as multiple unerupted/ impacted teeth and over retained primary dentition.

Keywords: Vit. D deficiency, enamel and dentin abnormalities, primary and permanent dentitions, multiple impacted permanent teeth, over retained deciduous teeth

1. INTRODUCTION

Tooth eruption and shedding is a continuous process, which replaces the exfoliated primary teeth with permanent teeth. The tooth eruption is defined as the occlusal or axial movement of the tooth from its developmental position within the jaw to its functional position in the occlusal plane, whereas the impacted tooth is known as the tooth which ceases to erupt in the oral cavity (Kumar, 2009; Vani et al., 2014). Sometimes impaired tooth eruption takes place in the form of delayed or complete absence of eruption, giving rise to impacted/embedded permanent teeth and over-retained deciduous teeth (Patil et al., 2015). Insufficient space, early loss of primary teeth with eventual closure of space, crowding of arches and rotation of tooth buds, maxillofacial or dentoalveolar trauma in childhood, ectopic eruption of an adjacent tooth, thickened overlying osseous or mucosal tissues, discrepancy in maxillofacial skeletal development or lack of correlation between maxillofacial skeletal development and tooth maturation, disturbances in eruption pattern, and consequences related to direct or indirect effects of cysts or neoplasm are the various causes of failure or delayed tooth eruption (Al Rakah et al., 2018).

Systemic causes such as syndromes, nutritional deficiencies of Vit D & Vit B12, metabolic and hormonal disorders can also contribute to multiple impacted permanent teeth. Vit D deficiency affects enamel & dentin formation and considered as an etiological factor for delayed eruption & multiple impactions of permanent teeth and over-retained deciduous teeth (Jairam et al., 2020). Idiopathic causes can be due to lack of eruptive force and intrinsic defects in the mechanism of eruption process. Complete lack of eruptive force can be the reason for unerupted tooth when the normal numbers of teeth are present radiographically, although this is debatable, since few workers disagree with this theory (Shetty et al., 2016).

The objective of the present study is to increase awareness among dental surgeons that cases of multiple impacted teeth always have to be evaluated under multiple etiologies and investigations. Vit D deficiency is predominantly due to intake of vegetarian diet and inadequate exposure to the available abundant sunlight in Indian population (Shetty et al., 2016). Report of two rare cases enamel and dentin abnormalities in primary & permanent dentitions and multiple impacted permanent teeth associated with vitamin d deficiency is presented.

2. CASE REPORT 1

A 17-year-old female referred to Department of Oral Medicine and Radiology with a chief complaint of pain in lower left back region of jaw since one month and also complain of missing teeth & small teeth. Patient had no relevant medical history. Patient's past dental history reveals that she has visited Government Dental Hospital with a complaint of small teeth 4 months ago and didn't receive any treatment. There was no history of extraction. She takes predominantly a vegetarian diet.

On General examination, the patient was of normal built and had no signs of mental retardation or skeletal abnormalities. Family history revealed that she was the second child of her parents, and her sibling also has similar type of morphological dentition (case 2). The patient was born to non-consanguineous parents. The pregnancy and delivery history were not contributory. On Extra-oral examination patient had a straight profile, vertical growth pattern, and competent lips (Fig 1, 2). Intra-oral examination revealed the presence of following over retained deciduous teeth 53, 54, 55, 63, 65, 73, 74, 75, 83, 84, and erupted permanent teeth 11, 12, 16, 21, 22, 26, 27, 31, 36, 41, 46 and partially erupted teeth 24, 17 and 27. The clinically missing teeth were 13, 14, 15, 18, 23, 24, 25, 28, 32, 33, 34, 35, 37, 38, 42, 43, 44, 45, 47, 48. The deciduous exfoliated teeth were 64, 72, 82 & 85.

There was deep occlusal caries and pulp exposure with 36 & 46. There was draining sinus with 46 & it was tender on percussion. Disto-occlusal caries was present with 65 and mesio-occlusal caries with 26. Root stumps were present with 31, 73, 41 & 83. There was generalised severe attrition. Severe attrition with pulp exposure is in 41, 31, and 83 (Fig 3, 4). Considering the clinical findings, a provisional diagnosis of acute exacerbation of chronic periapical abscess with 46 and multiple clinically missing permanent teeth/ partial anodontia with micro-dontic teeth was formulated. She was advised radiographic investigation like orthopantomogram (OPG), skull, hand & wrist and pelvic radiographs.

OPG revealed impacted teeth 13, 14, 15, 23, 24, 27, 28, 32, 33, 34, 35, 37, 38, 42, 43, 44, 45, 47, 48 (Fig 5). The skull, chest, hand & wrist and pelvic radiographic findings were within normal limits and showed no skeletal abnormalities (Fig 6, 7, 8, & 9). The patient was advised serological investigations to evaluate Vit. D, Vit. B 12, serum calcium, serum alkaline phosphatase and thyroid function test. Serum calcium, Vit B12 level & thyroid function test were within normal limits, whereas alkaline phosphatase level was marginally increased (344IU/L). There was severe insufficiency of Vit. D (8.5 ng/dl).



Figure 1 Photograph (front view) showing facial symmetry and competent lips.



Figure 2 Photograph (lateral view) showing normal vertical growth.



Figure 3 Intra-oral photograph showing occlusal caries with 36 & 46. Draining sinus associated with 46. Root stumps seen with 31, 73, 41 and 83.



Figure 4 Intraoral photograph showing disto-occlusal caries with 65 and mesio-occlusal caries with 26

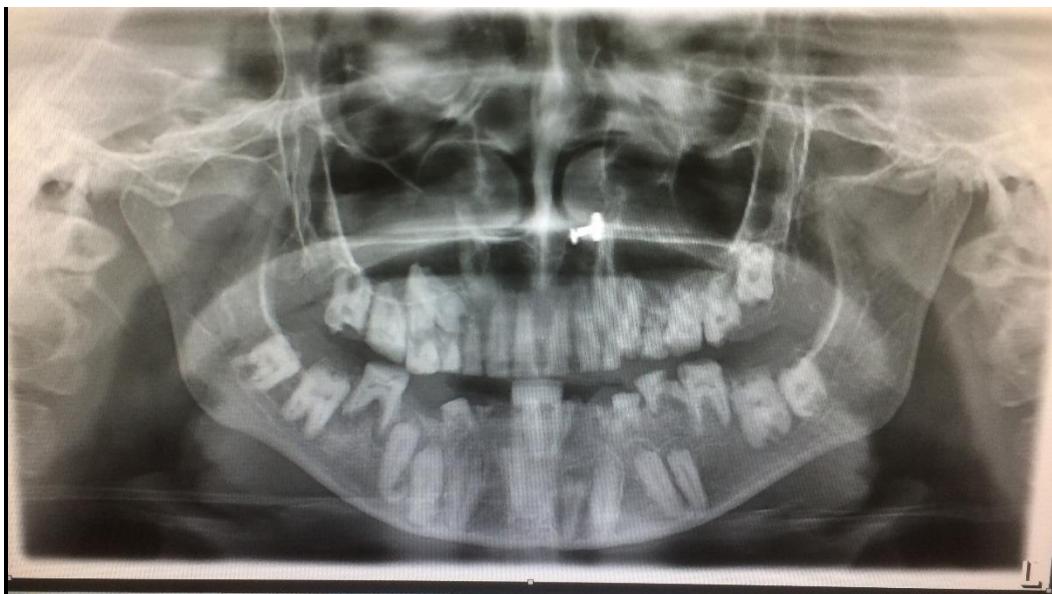


Figure 5 OPG showing multiple impaction of teeth with 13, 14, 15, 23, 24, 27, 28, 32, 33, 34, 35, 37, 38, 42, 43, 44, 45, 47, 48.



Figure 6 Skull radiograph did not reveal any skeletal deformities.

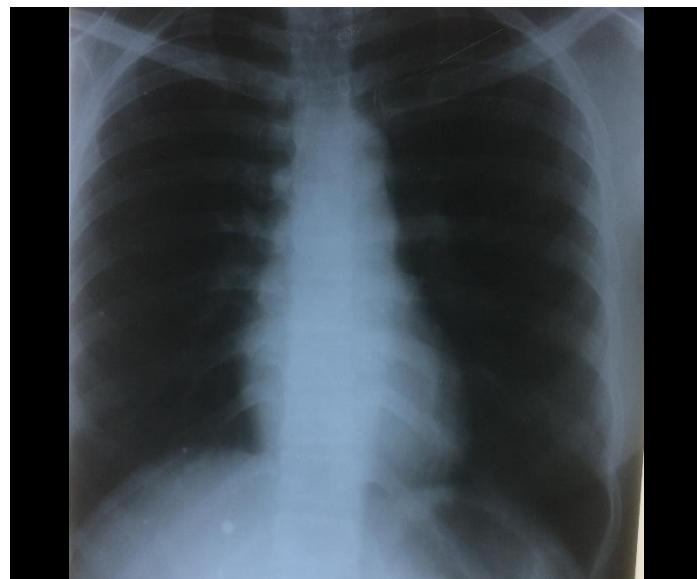


Figure 7 Chest radiograph did not reveal any skeletal deformities.



Figure 8 Hand & wrist radiograph did not reveal any skeletal deformities.



Figure 9 Pelvic radiograph did not reveal any skeletal deformities.

3. CASE REPORT 2

A 18-year-old male reported to Department of Oral Medicine and Radiology with a chief complaint of missing teeth & small teeth. He is a sibling of first patient. On General examination, the patient was of normal built. He had no signs of mental retardation or skeletal abnormalities. Family history revealed that he was the first child of her parents. The patient was born to nonconsanguineous parents. The pregnancy and delivery history were not contributory. He predominantly takes a vegetarian diet. Patient has no relevant medical & dental history. On Extra-oral examination patient had a straight profile, vertical growth pattern, and competent lips (Fig 1, 2).

Intra-oral examination revealed the presence of following over retained deciduous teeth 52, 53, 54, 55, 63, 64, 65, 71, 73, 74, 75, 81, 82, 83, 84, 85 and partially erupted teeth 16, 21, 26, 36 and 46. The clinically missing teeth were 11, 12, 13, 14, 15, 17, 18, 22, 23, 24, 25, 27, 28, 31, 32, 33, 34, 35, 36, 37, 38, 41, 42, 43, 44, 45, 46, 47 and 48. The deciduous exfoliated teeth were 51, 62 and 72. There was Deep occlusal caries with 53, 74 and 84; Occlusal facet with 54, 63, 64, 65, 75 and 85. No tooth was tender on percussion. There was generalised severe attrition (Fig 3, 4).

Considering the clinical findings, a provisional diagnosis of microdontia and multiple clinically missing permanent teeth/ partial anodontia was formulated. He was advised radiographic investigation like orthopantomogram (OPG) , skull, hand & wrist and pelvic radiographs. OPG revealed impacted teeth 11, 12, 13, 14, 15, 16 17, 21, 22, 23, 24, 25, 26, 27, 31, 32, 33, 34, 35, 36, 37, 38, 41, 42, 43, 44, 45, 46, 47 (Fig 5). The skull, chest, hand & wrist and pelvic radiographic findings were within normal limits and showed no skeletal abnormalities (Fig 6, 7, 8, & 9).

The patient was advised serological investigations which included Vit. D, Vit. B 12, serum calcium, serum alkaline phosphatase and thyroid function test. Serum calcium, Vit B12& thyroid function test were within normal limits, whereas alkaline phosphatase level was marginally increased (349 IU/L). The Vit. D level was significantly decreased (17.7 ng/dl).



Figure 1 Photograph (front view) showing facial symmetry and competent lips.



Figure 2 Photograph (lateral view) showing normal vertical growth pattern



Figure 3 Intraoral photograph showing deep occlusal caries with 74 and 84, occlusal facet with 75.



Figure 4 Intraoral photograph showing occlusal caries 54 and 63, 64, 65



Figure 5 OPG showing multiple impaction of teeth with 11, 12, 13, 14, 15, 16 17, 21, 22, 23, 24, 25, 26, 27, 31, 32, 33, 34, 35, 36, 37, 38, 41, 42, 43, 44, 45, 46, 47



Figure 6 Skull radiograph did not reveal any skeletal deformities.

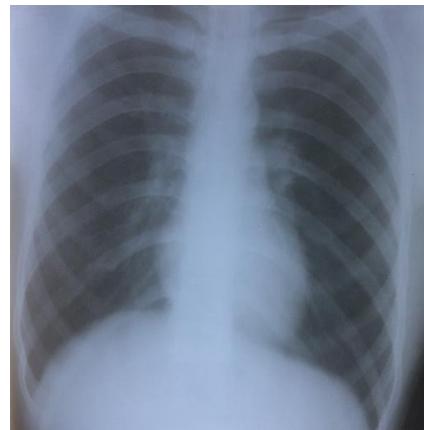


Figure 7 Chest radiograph did not reveal any skeletal deformities.



Figure 8 Hand & wrist radiograph did not reveal any skeletal deformities.



Figure 9 Pelvic radiograph did not reveal any skeletal deformities.

Both the patients were referred to medicine physician. Patients were prescribed softules of Vit D 60,000 IU weekly & calcium tablet once a day for 3 months. The dental rehabilitation management plan is being chalked out in consultation with oral surgeons, orthodontist, endodontist and prosthodontist.

4. DISCUSSION

The reported cases represent unique characteristics of multiple unerupted permanent teeth, multiple over retained deciduous teeth and generalised attrited deciduous & permanent teeth. Multiple unerupted permanent teeth are a rare finding, frequently found to be associated with syndromes such as cleidocranial dysplasia, Gardner syndrome, Zimmerman-Laband syndrome and Noonan's syndrome. Primary teeth are usually seen over-retained in conditions like hemi facial atrophy, hypopituitarism, hypothyroidism, cherubism, gingival fibromatosis, and cleft palate (Shivakumar et al., 2007; Yildirim et al., 2004). There are many reports of idiopathic failure of eruption of permanent teeth. There is no report in the literature of generalized retention of primary teeth, abnormalities of enamel & dentin of primary & permanent dentition and multiple impacted permanent teeth in the same patient. Primary retention of primary teeth and multiple impacted permanent teeth could be due to a defect in the dental follicle caused by disturbance in local metabolism and interference with the biological interactions necessary for the eruptive process (Bhuvaneswarri & Chandrasekaran, 2018).

Nutritional deficiency of Vit D has been associated with disturbances in the oral structures. It has been shown to affect enamel & dentin formation and has also been considered as etiological factor for delayed eruption/ impacted teeth (Jairam et al., 2020). Physiologically the importance of Vit D relies on its ability to maintain intra and extra cellular calcium and phosphate concentration in order to preserve the metabolic function such as promotion of health, mineralization, growth, maintenance and remodelling of the bone. Researches have demonstrated the relationship amongst the vit D and several acquired or inherent conditions. A representative selection of these illnesses includes, but not only limited to, rickets and osteomalacia. Vit D deficiency has shown to affect the formation of enamel & dentin. It has been also considered a risk factor for causing dental caries. Vit D deficiency has shown to result in delayed eruption and/or multiple uneruptions of teeth (McCauley & Somerman, 2012). In our represented cases, there was generalised over retained deciduous teeth, abnormalities of enamel & dentin in primary & permanent impacted permanent teeth.

Other conditions related to vit D deficiency, familial hypophosphatemia, a rare inherited disorder with an impairment of phosphate transport in the blood and diminished vit D metabolism in kidneys, hyperparathyroidism, hypocalcaemia, osteoporosis amongst others (Sujatha et al., 2012). The impact of vit D deficiency in the oral cavity results in dental abnormalities, delayed formation and delayed eruption of teeth, abnormal radiolucency & loss of cortical bone of jaws (In radiographs) and decreased muscle tone (McCauley & Somerman, 2012). Though the Vit D deficiency has several oral manifestation, its severity depends on time at which the deficiency occurs. The earlier it occurs, the greater and deeper are the undesirable oral consequences. Although the literature regarding vit D deficiency and its oral consequences is limited, all health care providers agree on the importance of having consistent dental care (Goodman et al., 1998).

In both the cases, there was Vit D deficiency. Other serological investigations such as serum calcium & serum alkaline phosphatase were assessed which were almost within normal limits. Syndromes were eliminated because of lack of associated signs and symptoms of syndromes. Based on the clinical presentation and serological investigations, both cases were diagnosed as "Multiple enamel and dentin abnormalities and Multiple Impacted Permanent Teeth associated with Vitamin D deficiency".

5. CONCLUSION

Nutritious diet is an important factor in the promotion & maintenance of good health. It also plays an important role in development and maintenance the body structure and their functions. Vit D deficiencies at very young age have several consequences on the normal growth and development of oral structures. Appropriate interdisciplinary care is needed to successfully address dental abnormalities in primary and permanent dentitions. The attention of dental surgeons is drawn to consider Vit. D deficiency as one of the fore most nutritional deficiency responsible for abnormality of enamel & dentin as well as multiple unerupted/ impacted teeth and over retained primary dentition.

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Author Contributions

Dr. Ramhari Sathawane, Dr. Vidyarjan Sukhadeve, Dr. Ashish Lanjekar intellectualised the case and had planned the treatment. Dr. Dhiran and Dr. Kshitija have contributed in compiling the literature associated with case report. Dr. Rakhi Chandak has provided an important revision of the manuscript.

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Conflict of Interest

The authors declare that there are no conflicts of interests.

Informed consent

Informed consent of patients is taken.

Data and materials availability

All data associated with this study are present in the paper.

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